THE AMERICAN PYRGOMORPHIDAE (ORTHOPTERA)

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INTRODUCTION

The Pyrgomorphidae constitute a well-defined family of 145 genera and rather more than 400 species of "bush-hoppers" (a term preferable to "grasshoppers" as the majority are not associated with grass), most of which are tropical or subtropical (Kevan, 1977). Rather few are found in temperate regions, but they occur there in both northern and (in the Old World only) southern hemispheres. Two or three species can withstand fairly rigorous winter conditions, for which, however, they do not appear to be specially adapted. Pyrgomorphidae have virtually no fossil record (one rather uninformative, and possibly dubious specimen from the Miocene of central Europe), but it is believed that not many living species remain to be discovered.

ZOOGEOGRAPHY AND PHYLOGENY

The Pyrgomorphidae are clearly a "Gondwanaland" assemblage, and their epicentre of evolution may be postulated to have been "Lemurian", for they show their greatest diversity, as judged by the number of tribes, in the Southeast Asian area and in Madagascar. The region of major speciation at present, however, seems to have shifted westwards, for the greatest number of genera and species are now found in Madagascar and particularly in Africa. The probability of a "Lemurian" origin for the Pyrgomorphidae finds some support in the occurrence, only in the Mascareigne Islands of the Indian Ocean, of the anomalous, monogeneric, relict subfamily Pyrgacridinae (Kevan, *in* Eades and Kevan, 1975).

Although the Pyrgomorphidae represent an old family, their presence in Africa, or at least the more northerly and westerly parts of that continent, is porbably more recent than the Cretaceous, for there appears to be little in common between the Pyrgomorphidae of Africa and those of South America. That is, there seems to have been no common origin for the faunas of the two continents prior to their separation. It would, indeed, be very accommodating if the isolated, monotypic, West African genus *Chapmanacris* could be shown to be in any way closely related to the geographically isolated (?), monotypic genus *Algete* from NE Brazil, but it cannot. The two genera differ radically, not only in external morphology, but also in the form of their concealed copulatory structures (Kevan *et al.*, 1971, 1974). *Chapmanacris* is an anomalous genus, placed in its own tribe and superficially resembling Oriental and Malagasy Orthacridini and other cylindrical, apterous and micropterous tribes, including the Mexican Ichthyotettigini, to none of which it appears to be particularly close taxonomically. *Algete*, on the other hand, is clearly derived from the same stock as the few other South

American pyrgomorphid genera (tribe Omurini), the least specialized of which, in terms of gross external morphology (though not in its phallic structures), is *Minorissa,* which is also the most northerly and westerly member of its tribe. This genus is superficially very similar in appearance to the widespread Old World (predominately Oriental) genus *Atractomorpha,* to which, nevertheless, it bears no close relationship, though there may be some remote connection. It is also very similar externally to the monotypic Malagasy genus *Schulthessia,* to which it is not closely related either (Kevan *et al.,* 1974). The relationships of the Omurini seem, in fact, closest to the Mexican and Central American Sphenariini (Sphenariina), which are, however, quite different in appearance (Kevan *et al.,* 1974).

Convergence in external morphology is very common in the Pyrgomorphidae, and the four American tribes, each with its own characteristic general appearance, all have Old World counterparts among unrelated tribes. Thus, as already noted, the Omurini of South America (see Kevan, 1966) have their unrelated Eastern Hemisphere counterparts, the Atractomorphini and Schulthessiini (see Kevan, 1961). Whilst all three tribes include narrowly fusiform, fully alate genera with acutely conical heads *(Minorissa, Atractomorpha, Schulthessia),* it is of interest to note that both Omurini and Atractomorphini also include apterous forms with depressed bodies *(Algete* and *Omura; Occidentosphena,* the last differing from the others in being much less elongate—see Kevan *et al.,* 1974); there also appears to be a genus of Schulthessiini with somewhat reduced wings *(Buyssoniella),* although the unique holotype of the only species has been lost (Kevan *et al., op. cit.).* Both genera of American Sphenariini (from Central America and Mexico) belong to a distinct subtribe (Sphenariina) which has three related subtribes in the Old World, but there are also convergent members of other unrelated tribes, notably the Parasphenina of the tribe Pyrgomorphini, and particularly the genus *Chirindites,* which is not only very similar in size, form and variation in colour, but which lives in similar situations and even exhibits (like the American *Sphenarium* and *Prosphena)* an unusual phenomenon whereby the males are often as large as or even larger than females. The type species of *Parasphena* was indeed first described in *Sphenarium.* Some larger specimens of *Pyrgomorphella (Phyrgomorphina)* are also rather reminiscent of less robust Sphenariini.

The other two American tribes (see Kevan *et al.,* 1964) are both exclusively Mexican, the one (Ichthiacridini) having a slender, subcylindrical shape and, usually, minute scale-like vestigial tegmina; the other (Ichthyotettigini) being usually even more cylindrical, with generally blunter heads, quite apterous and often with complex male abdominal terminalia. Perhaps the closest Old World parallel of these two tribes would be a comparable pair from Madagascar: the Sagittacridini and the Geloiini (Kevan *et al.,* 1970). As already noted, the West African Chapmanacridini and the Malagasy and SE Asiatic Orthacridini (as well as some other groups) are also rather similar in overall appearance, particularly to Ichthyotettigini. Whilst the Chapmanacridini appear to be unrelated to any of the others, it has been suggested that the Ichthiacridini may be remotely related to the Orthacridini (see below) and that the Ichthyotettigini may, in turn, have been derived from something like the former tribe (Kevan *et al.,* 1970).

American Pyrgomorphidae seem to fall into two distinct groups, the Sphenarini-Omurini group and the Ichthiacridini-Ichthyotettigini group. The former has connections with other Sphenariini in the Orient (the closest relatives are the Mekongianina of SW China, SE Tibet and NE India). The latter group probably has less in common with Old World forms, but there are certain features in addition to body-form which suggest some remote connection with the Orthacridini. That tribe and the Ichthiacridini both have, for example, the "aedeagal sclerites" partially divided apically (Kevan *et al.,* 1971), or, more correctly (Eades and Kevan, 1975), they both have indications of true aedeagal sclerites at the apices of the gonopore processes.

Such indications as exist all point to the American Pyrgomorphidae being incursors into the New World, derived from Asiactic ancestors, presumably entering North America by an ancient, comparatively warm, Beringian connection, such as is invoked to explain the occurrence of other groups of organisms common to more southerly region of Asia and North America, but which are currently absent from cooler, more northerly latitudes. It would also seem that incursions from Asia occurred at least twice. The earlier of the

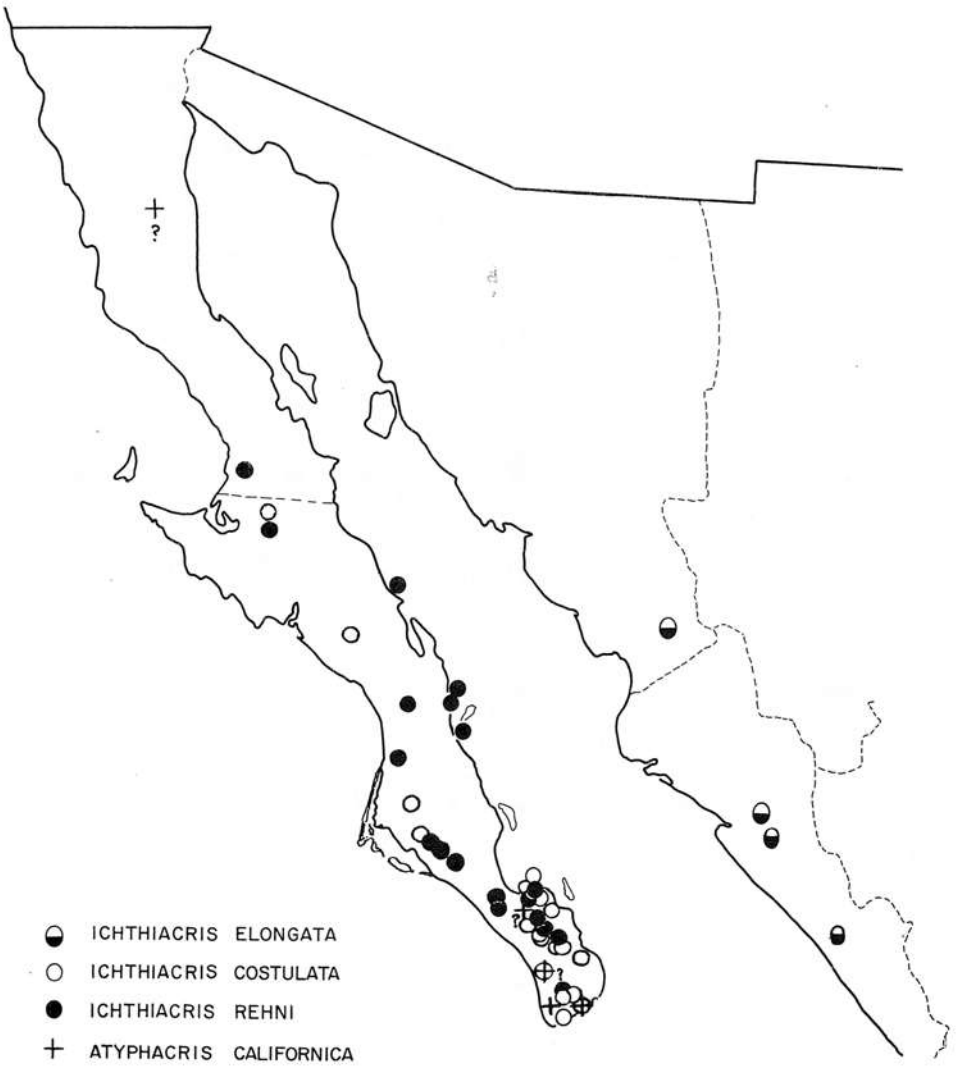

Fig. 1. Known distribution of Ichthiacridini in N.W. Mexico

two was possibly "sphenariine", including some fully winges forms. In this connection it may be noted that the most primitive sphenariine to-day is *Rubellia nigrosignata* Stal of Madagascar, which is brachypterous, rather than micropterous, not infrequently producing fully winged forms; and the rare *Sphenexia fusiformis* Karsch of Tanzania may conceivably prove to be similar in this respect. Although all other Sphenariini, including American ones, would now seem to have reduced their wings to the point of no return, surprising reversions to a fully winged state nevertheless occur in certain micropterous Pyrgomorphidae. Perhaps the most striking example of this is the Australian *Psedna nana* Rehn f. *macroptera* Kevan *et al.* (see Key, 1972).

The reason for suggesting a winged condition for some at least of the earlier "sphenariine" invaders is that the exclusively South American Omurini and the exclusively Mexican and Central American Sphenariina may have had a common ancestor (Kevan *et al.*, 1974), and yet the former group contains the only fully winged and the

only short-winged[1] American pyrgomorphids, *Minorissa pustulata* Walker and *Deraspiella volxemi* (Bolívar), respectively. The ancestors of the Omurini, having entered South American from North America, became isolated and scattered quite widely throughout the tropics but were unable to cross the Cordillera. Having become established in their new continent they followed the general inherent tendency among Pyrgomorphidae to lose their wings, for the other two genera, *Omura* and *Algete,* are apterous. It is a matter for comment that, despite the widespread predominance of flightless forms amongst Pyrgomorphidae, the two alate species mentioned are the only ones in the entire American fauna that have more than minute scale-like vestiges of wings.

That the ichthiacridine-ichthiotettigine ancestors entered America later than the others is purely conjectural, based on the fact they are the most northerly of the American Pyrgomorphidae. Contrary to this surmise, it could be that they were the earlier to arrive, for their relationships with Old World tribes are more distant in terms of both morphological affinity and geography. They are also of very low vagility, for none of them, nor any of their possible Old World relatives, has more than the minutest vestiges of wings. As with the sphenariine-omurine group, one tribe is northern and the other southern. Both are found entirely within the confines of Mexico, but they do not overlap to more than a small degree, the limits of their respective distributions being more or less contiguous. The less specialized tribe, the Ichthiacridini, which retains both traces of true aedegal sclerites and, in almost all, vestigial tegmen-scales, have remained behind in the more northerly parts of the country, and, in general, in lower, more arid regions. They may be said to be basically Sonoran. It is interesting that more than half of the few known species are isolated in Baja California. The Ichthyotettigini, which do not retain the characters mentioned, which have highly specialized male copulatory structures, and which may be derived from ichthiacridine-like ancestors, are all more southerly and incline to somewhat higher elevations and/or less arid situations. Of this tribe, the most highly specialized (*Piscacris* and *Pyrgotettix)* are, in general, the most southerly.

Before leaving the matter of the origins of the American Pyrgomorphidae, brief reference should perhaps be made of the exclusively South American family Tristiridae[2], which, as discussed at some length by Eades and Kevan (1975), has apparently some affinity to the Pyrgomorphidae. By contrast whith the poor representation of the latter family in South America, no less than 16 (and possibly more) genera of Tristiridae are known. Furthermore they are almost exclusively Patagonian or Cordilleran; precisely what the Pyrgomorphidae are not. They are presumably descended from ancient "austral" stock, which also gave rise to the southern African Lathiceridae and Lentulidae (the latter reaching East Africa) as well as to the Pyrgomorphidae. That the Pyrgomorphidae and Tristiridae (and the other two families) appear to be distantly related (Eades and Kevan, 1975) does not mean that the South American Pyrgomorphidae have any immediate common ancestry with the Tristiridae, because the latter are southern and the former (so far as the Americas are concerned) northern in origins.

AMERICAN GENERA AND SPECIES

As indicated in Table I, there are only 14 American genera of Pyrgomorphidae, many of them monotypic, with but four monotypic genera in South America. With the four species included in these, there are only 22 known species, 17 out of the 18 additional species being Mexican, and, of these, one is too poorly known to describe and

[1]Not strictly brachypterous as the tegmina are of moderate lengt.

2 Should *Aspidophyma americana* Bolívar eventually prove to belong to the same family, which it may well do, the family name would have to be changed to Aspidophymidae, for the oldest available group name would then be Aspidophymae Bolívar, 1884, which would take precedence over "Tristiri" Rehn, 1906, and "Chilacrinae" Liebermann, 1943 (Eades and Kevan, 1975). The earliest used "Group" name has priority in such cases, not the earliest named genus, as was used by Dirsh (1975).

two are new, both in the genus *Sphenarium*. Two include two subspecies each. One of the Mexican species extends into Guatemala; the non-Mexican species *(Prosphena scudderi* Bolívar) occurs from Guatemala to Costa Rica, but is not yet known from Panama.

With the exception of *Sphenarium,* all the Mexican and central American species have been reviewed by Kevan *et al.* (1964), and all the known South American species by Kevan (1966). Kevan *et al.* (1971) list all the genera and species of Ichthiacridini and Ichtyotettigini, and then later (Kevan, *et al.,* 1974) do the same for the Omurini and Sphenariini, the last including preliminary synonymies in *Sphenarium.* Full bibliographic references to all species are given by Kevan *(in press).* Revised information on distribution accompanies this contribution (Figs. 1-6; Table I; Appendix I) and one species of *Ichthiacris* has fallen into synonymy (Appendix I). *Sphenarium* has now been revised (Boyle, unpublished 1974; Kevan & Boyle, *in preparation)* and some of the results are included here: distribution maps (Figs. 3, 4), a further synonymy (Table I), and preliminary diagnoses of two new species (Appendix II).

The extreme variability of most members of the genus *Sphenarium,* both in size and coloration, as well as in other morphological features, has bedevilled its taxonomy for a century. A study of the concealed copulatory structures, however, has now made possible a reasonable solution to the major taxonomic problems, and different species and subspecies are now shown to have fairly definite zoogeographical distribution patterns (Figs. 3, 4). As noted by Kevan (1973), however, the variation is such that, in some species at least, the external morphology and coloration of different species in the same areas tend to converge. This is particularly marked, for example, in the case of the new

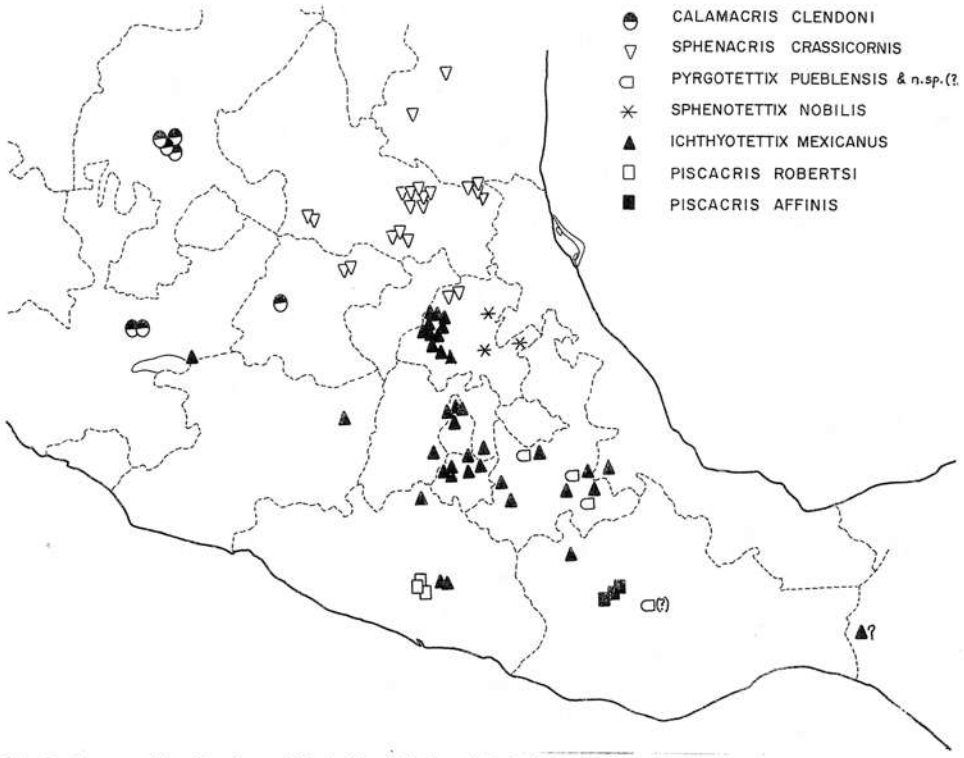

Fig. 2. Known distribution of Ichthiacridini and Ichthyotettigini in central and southern Mexico (After Kevan *et al.,* 1964, slightly modified).

species, *S. variabile,* which is sometimes virtually impossible to distinguish externally from *S. purpurascens* Charpentier in the same region. In fact, one can almost say that the more closely associated the two sympatric species, the more alike they appear. Their phallic structures readily distinguish them, but it would seem that similar ecological pressures

result in almost identical phenotypes in the two species. How much of the similarity is due to environmental and how much to genetic effects would prove to be an interesting field of study. A somewhat contrary phenomenon has also shown itself recently in *S. mexicanum* Saussure, a species of enormous size differences and colour range, from which it has been found impossible to distinguish *S. histrio* Gerstaecker beyond the subspecies level. Yet a population of undoubted *histrio* has been found in the Vera Cruz coastal region virtually surrounded by *S. mexicanum mexicanum.* In this case a much more

Fig. 3. Known distribution of *Sphenarium* in Mexico (1) and in Guatemala.

detailed knowledge of the exact geographical distribution is needed in order to ascertain if there is, or might recently have been, any continuance between the isolated and the main *histrio* populations (see Fig. 3). Or is there here perhaps an example of local topotypic subspeciation? Insufficient data are yet available to answer this question, but much could undoubtedly be learnt about the principles of biological variability by a detailed study of *Sphenarium.*

Bibliographic references to all aspects of the American Pyrgomorphidae are given by Kevan (1977), but some of the more significant points related to other than systematic matters may be noted here.

MORPHOLOGY

Most of what is known of the morphology and anatomy of American Pyrgomorphidae relates to their copulatory structures and will be found in the works of Marquez Mayaudon (1962) for *Sphenarium,* Kevan *et al.* (1964) for Ichthiacridini, Ichthyotettigini, and *Prosphena* Kevan (1966) for Omurini; and Kevan *et al.* (1971, 1974)

for each genus. The last mentioned works also review the previous literature on the genitalia of the relevant tribes, so that there is no need to repeat the references here. The only subsequent literature reference to this aspect of morphology is given by Dirsh (1975) for *Omura;* nothing new is added to what was previously known. Boyle (1974) and Kevan and Boyle *(in preparation)* give details of the concealed copulatory structures of the species of *Sphenarium,* including their variation.

With regard to other aspects of morphology, the earliest reference to a particular morphological feature in American Pyrgomorphidae is that of Graber (1876), who notes the presence, in *Sphenarium,* of an abdominal tympanum despite the fact that the genus is mute and micropterous. The tympana of *Omura* and *Sphenarium mexicanum* are considered by Knetsch (1939) and referred to by Mason (1969). Banerjee and Kevan (1962) also refer briefly to the tympanum of *S. p. purpurascens* (incorrectly as *S. mexicanum).* Salfi (1935) merely comments on the gratly produced head of *Omura* (also as *Protomachus)* which causes it to have what he terms a metahypognathous,, oxycephalous form. Beier (1955, 1971) notes that the elongation of the fastigium of the head of *Omura* (as *Protomachus)* has resulted in a distal positioning of the antennal bases.

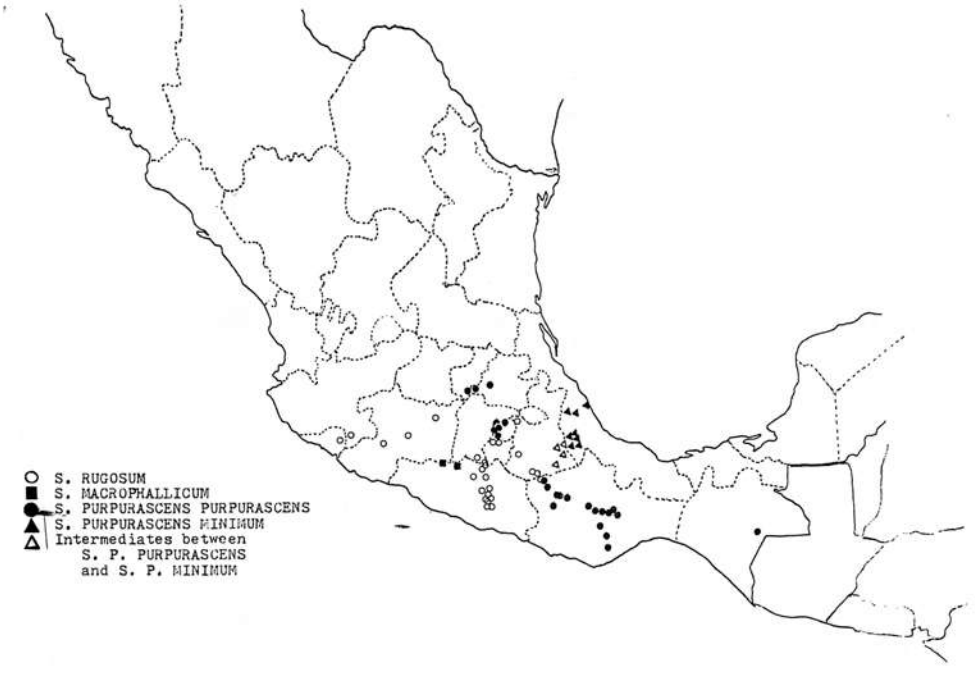

Fig. 4. Known distribution of *Sphenarium* in Mexico (2).

Kevan *et al.* (1964) and Kevan (1966), in addition to figuring the genitalic structures, illustrate various other external morphological features of Icthiacridini and Ichthyotettigini, and of Omurini. Morphological and colour variations in *Sphenarium* are discussed by Boyle (1974) and Kevan and Boyle *(in preparation).*

Very little information has been published on internal anatomy other than that directly associated with copulatory structures. Laird (1943), however, notes that the male gonads are of a radiate type in *Ichthyotettix mexicanus* and *Sphenarim (mexicanum) bistrio,* and Banerjee and Kevan (1962) comment that the brain is horizontal (rather than subvertical) on account of the anteriorly-produced form of the pyrgomorphid head in *Sphenarium p. purpurascens* (as *S. mexicanum);* they also note that the three dorsal

gastric caeca of this species are smaller than the ventral ones. In summary, knowledge of the anatomy of American Pyrgomorphidae is fragmentary, although, relatively speaking, it is scarcely more so than for Old World Pyrgomorphidae, with the exception of a few well known genera, such as *Poekilocerus, Zonocerus* and *Atractomorpha.*

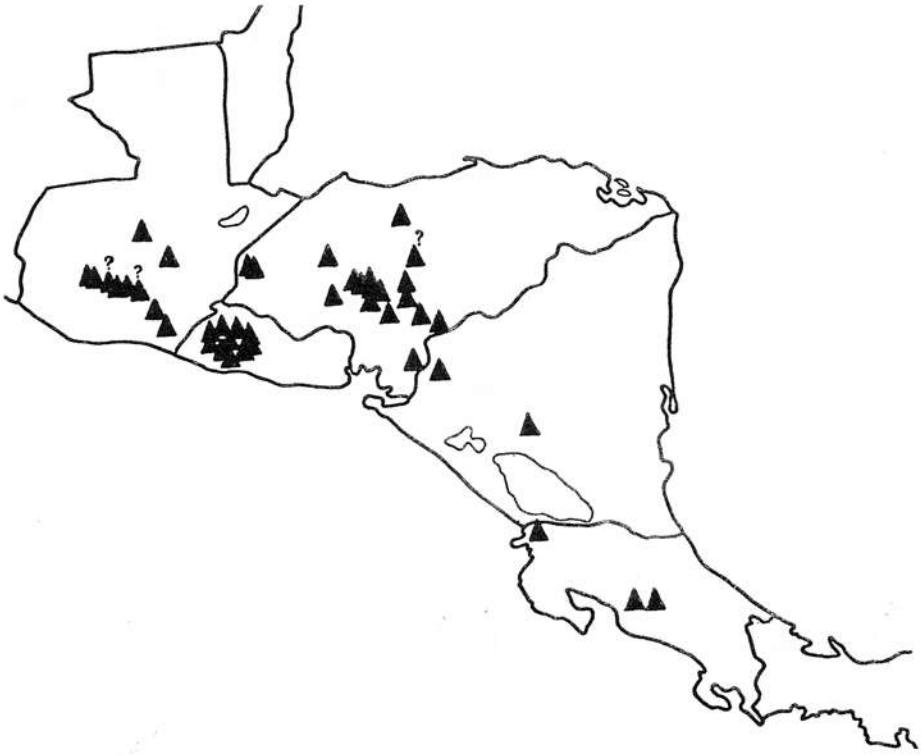

Fig. 5. Known distribution of *Prosphena scudderi* Bolívar in Central America (After Kevan *et al.,* 1964).

CYTOLOGY

Only *Sphenarium* among American Pyrgomorphidae, has been at all studied cytologically. In 1930, McClung (1932) presented a paper at Montevideo, in which he illustrated the metaphase chromosomes of (presumably) *S. m. mexicanum.* An important cytological principal was demonstrated, namely, that chrosmosome fusion may occur, and he reported a chromosome number 2n♂ = 17 in some specimens– i. e. a difference from the modal number of 19 for Pyrgomorphidae generally. In a later paper (McClung, 1941), he also gave further details of the chromosomes at prophase in spermatocyte formation. Various subsequent authors (listed by Kevan, 1977) refer to his work. Powers (1942) compared the chromosomes (number 2 n♂ =19) in *S. (m.) mexicanum* and *S. (p.) purpurascens* with those of other Acridoidea. Giral (1954) notes that the diploid chromosome number of two species in n = 10. Helwig (1958) refers to *S. (p) purpurascens* in his discussion of the importance of cytology to taxonomy.

BIOLOGY AND ECOLOGY

Remarkably little is known of the biology and ecology of American Pyrgomorphidae, despite the fact that one of them has been known for more than 200 years: Houttuyn (1766) figured what was undoubtedly a Surinam specimen of *Omura congrua* (although he seemed to think it was African), likening it to Linnaeus' *"Gryllus Acrida Nasuta"*.

Omura congrua seems to prefer areas of high humidity and it is believed that since it has a depressed body-form, it usually rests motionless, closely adpressed to the petioles or midribs of leaves, or, since it is sometimes striped, to woody stems; it has been observed most frequently on vegetation along forest trails, but it has also been taken on low trees in drier situations (Kevan, 1966). An illustration (not identifying the insect) by Zahl (1959) is accompanied by a caption stating that it was found on a blossom cluster upon which it was alleged to feed. The figure shows the insect clinging upright on an unidentifiable stem. Another (anonymous) caption to the same figure published later (Zahl, 1976) is misleading as it suggests a grass habitat. *Minorissa* seems to prefer areas of low vegetation in generally moist open environments, and *Algete* apparently feeds on some sort of (labiate?) weed (Kevan, 1966) as well as (presumably) other vegetation.

There seems to be virtually no information on the biology or ecology of Ichthiacridini or Ichthyotettigini except for an occasional indication of their general habitat, and a note by Márquez Mayaudon (1968) that he found adults of *Ichthyotettix mexicanus* in the Federal District of México from April to June.

A little more is known for *Sphenarium.* Máquez Mayaudon (1962) indicates that adults of *S. (p.) purpuracens* and *S. [m.] mexicanum* seem to appear in september and to disappear by mid January, mating from October to November. Among Plants eaten are the Compositae *Vigniera dentata* and *Helianthus annuus,* of which they consume many "pétalos" (i.e.ray florets). In the laboratory, *S.p.purpurascens* deposited egg–pods containing 15-20 eggs a few centimeters below the soil surface. Four numphal instars are reported and the development is said to be rapid. The egg stage probably lasts from January until August. The same author (Márquez Mayaudon, 1965) found adult *"S. purpurascens"* in numbers (many of them *in copulo)* from September to November, mostly on Compositae [It is possible that the species was, *S. rugosum* as I have not seen *S. p. purpurascens* from the state referred to (Guerrero), although the latter is widely distributed and may indeed have been involved]. *S. p. purpurascens)*: is also recorded in the Federal District of México from July until November (jueveniles, males and females) by Márquez Mayaudon (1968). At the International Congress of Entomology, held in Washington, 1976, this author mentioned that *S. mexicanum* has one generation per year, breeding about September. Nava Pastrana (1975) tested the colours preference of S. [*p.*] *purpurascens* and, in preliminary experiments, found that the "colours" of preferred surfaces were white and grey, and that red, green and black, were the least favoured of those tested. It is inferred that yellow, brown and blue were intermediate in attractiveness. Similar results were found for adults and nymphs.

BIOCHEMISTRY

Although there seems to have been no study on any aspect of the physiology of American Pyrgomophidae, there have been a few biochemical investigations on *Sphenarium.* Giral (1946) analysed the bodies of *S.* [*p.*] *purpurascens* for fats and mineral content, and the same author (Giral, 1954) later tested two species of the genus (presumably including *S. p. purpurascens)* for the presence of toxic sulphur compounds (such as were found in the romaleid, *Taeniopoda* and the acridids, *Melanoplus* and

Schistocerca); he obtained negative results. Grimaldo *et al.* (1958) give an analysis of the nitrogen, protein, cystine and tyrosine contents of "chapulines" *(Sphenarium* spp. - see below). Massieu *et al.* (1959) also give several analyses of the chemical composition of "chapulines", which showed a high content of protein, calcium, phosphorus, and niacin. A number of subsequent authors quote one or another of the above references; they are listed by Kevan (1977).

USE AS HUMAN FOOD

Although the word *chapulli* (derived from ancient Mexican or Aztec) seems to have originally referred to abundant (edible?) grasshoppers of several genera, including *Sphenarium,* that formed the basis of many place-names (Morales Agacino, 1956), the modern "chapulin" is applied particularly to *Sphenarium* species, which have been articles of human diet in Mexico (particularly in Oaxaca) since before the Spanish conquest, and they are still eaten today (Grimaldo *et al.* 1958; Massieu *et al.* 1959). They may be dried for future use or fried, and they appear to be of considerable nutritive value (Massieu *et al.,, op. cit.).* A number of subsequent authors have cited the references given, and these are listed by Kevan (1977). Márquez Mayaudon, also mentioned the use of *Sphenarium* as human food in an address at the International Congress of Entomology, Washington, 1976. DeFoliart (1975), who refers to Massieu *et al.* (op. cit.), suggests various additional uses for the insect protein.

CROP PESTS

The only American pyrgomorphid genera that have so far proved to be crop pests are *Sphenarium* and *Prosphena,* although there is actually a single record of *Algete* being taken on cotton (Kevan, 1966). *Sphenarium* is included among long known Mexican agricultural pests by Morales Agacino (1956). *S. p. purpurascens* is referred to, along with *Melanoplus mexicanus mexicanus,* by Bosque Flores and Delgado (1951), as causing serious damage year after year to alfalfa, barley, red peppers, vegetables, maize, oranges, soya beans, tobacco and other crops, in pratically all Mexican states (though only 12 are mentioned by name). It is not indicated which crops or states are included for *Sphenarium* (which is certainly unrecorded from some of the latter). Only some states that harbour *Sphenarium* (see Table I) are included among those from which *S. p. purpurascens* is known, so that it is difficult to judge the importance of this or other species from the information given by these authors. The difficulty of identification is, in fact, pointed out. This paper also refers largely to *Schistocerca* and gives an account of various experiments with different insecticides, such as benzene hexachloride, chlordane and parathion, but what part of the work refers specifically to *Sphenarium* is not clear. The paper indicates that much more work needs to be done on all economic aspects. Boush (1954) states more specifically that *S. p. purpurascens* adults were almost wholly involved in a number of serious "grasshopper" outbreaks, particularly in the coastal and southern regions of Mexico in the late summer of 1952, and that the species is an annual pest in the Central Mesa. It was thought that the grasshoppers imigrated into the fields, as weeds and grasses were severely defoliated at the margins of fields and along ditches. Tests using seven different chlorinated hydrocarbon and organophosphorous insecticides against the insects were carried out in the field and in the laboratory. That *S. p. purpurascens,* can be a serious pest (occurring in very large numbers) was also indicated to me by Drs. Douglas Barnes and George B. Riley, Agriculture Division of the Rockefeller Foundation, who sent me numerous specimens taken by G. M. Riess, A. Gonzales, and F.

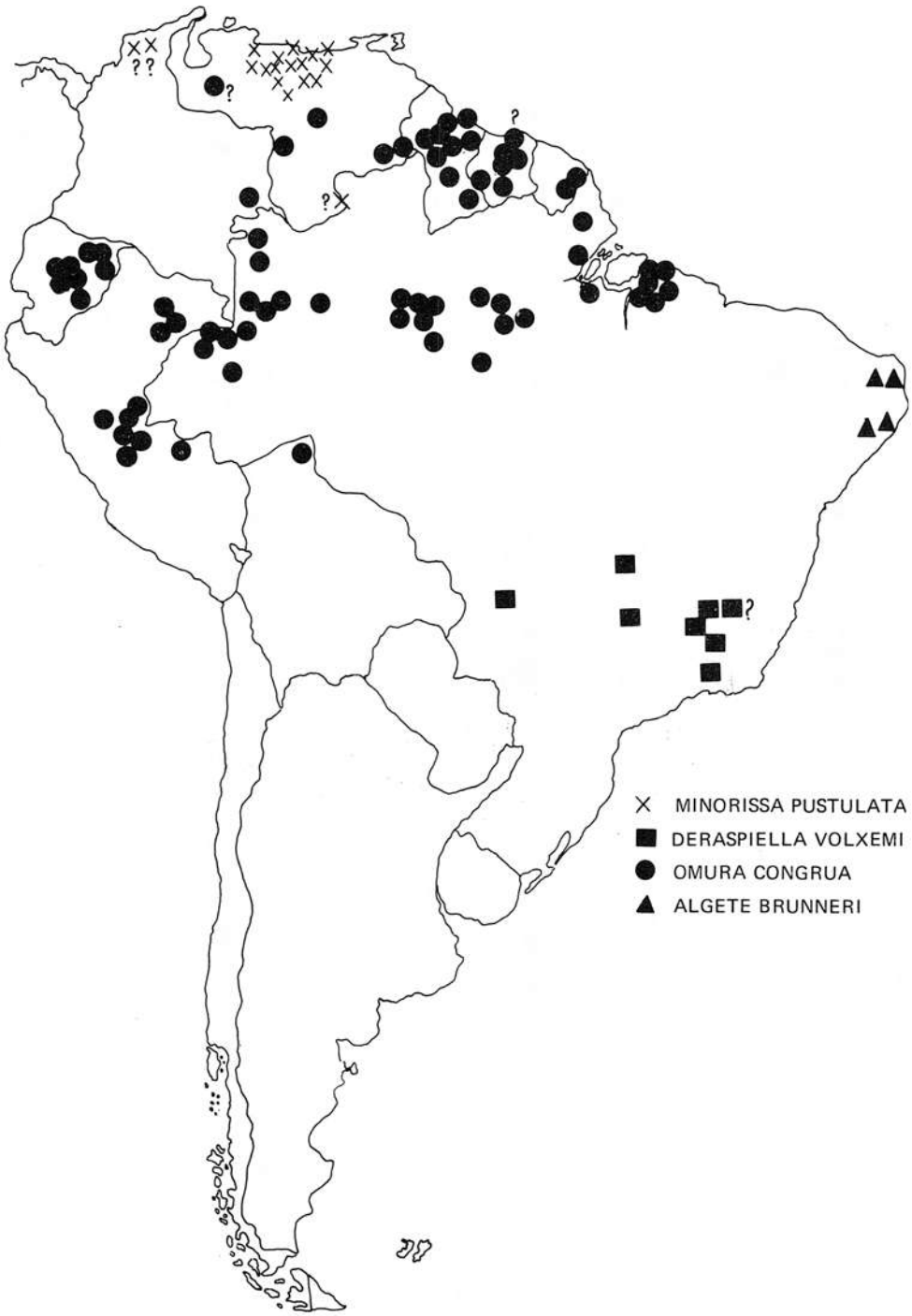

Fig. 6. Known distribution of Omurini in South America.

Gonzales dam aging crops at Chapingo, Federal District of México in September, 1954. Nava Pastrana (1975) also states that the "chapulin," *S. p. purpurascens* can be a serious pest ("plaga"). *Prosphena scudderi* also seems to be a potential, if not an actual, pest from time to time, although virtually no information seems to have been published. It is recorded from coffee in El Salvador by Berry (1953), although he notes that only a few specimens were observed.

CONCLUSION

From what has been discussed above, it may be deduced that the taxonomy and general distribution of the American Pyrgomorphidae is reasonably well understood, although several species are poorly known. The genus *Sphenarium,* in particular, however, bears further investigation from the point of view of intraspecific variation, and especially interspecific convergence or parallelism. Some valuable lessons of wider application would doubtless emerge from such studies. Certain aspects of zoogeography still need clarification, although it seems unlikely that it will be possible to deduce much further regarding relationships between American and non-American Pyrgomorphidae without the aid of fossil material.

Very little is known of the anatomy and physiology of the American Pyrgomorphidae, but the situation is not very different from that of most (but not all) Old World species of the family, and of Acridoidea generally. Earlier studies on the cytology of *Sphenarium* have proved useful, but much interesting and valuable information could be obtained from up-to-date cytogenetic studies of the genus, particularly in relation to the phenotypic variation referred to above.

Further investigations on the possible increased use of *Sphenarium,* and presumably of *Prosphena,* as human food should also be encouraged, particularly since the insects traditionally form part of the diet of local peoples. Other uses for their protein in times of particular abundance (*cf.* DeFoliart, 1975) should also be investigated.

Detailed studies on the actual and potential role, particularly of the two genera mentioned above, as crop pests are greatly needed, especially in respect of the species of *Sphenarium* that are habitually involved in different areas and as regards the ecological factors causing major outbreaks.

TABLE I - LIST OF THE KNOWN AMERICAN SPECIES OF PYRGOMORPHIDAE
Type species of genera marked with an asterisk (*)]

Tribe/Subtribe/Genus	Species/Subspecies	Primary Synonyms	Distributionn
ICHTHIACRIDINI			Mexico
Sphenacris Bolívar, 1884			E. & C. Mexico
	**S. crassicornis* Bolívar, 1884		States of Tamaulipas, San Luís Potosi, Guanajuato & Hidalgo
Calamacris Rehn, 1904			C. & W.C. Mexico
	**C. clendoni* Rehn, 1904		States of Zacatecas, Jalisco & Guanajuato
Ichthiacris Bolívar, 1905			
	I. costulata Bolívar, 1905	*I. californica* Bolivar, 1905 (syn. nov.); *Calamacris mexicana* Bruner, 1906; *C. oculata* Bruner, 1906; *C. palmeri* Bruner, 1906	Baja California Baja California
	I. elongata Kevan *et al.*, 1964		States of Sonora y Sinaloa
	**I. rehni* Bolívar, 1905		Baja California
Atyphacris Kevan *et al.*, 1964			
	**A. californica* (Bruner, 1906)	*Calamacris c.* Bruner, 1906; *Ic* [*b*] *thiacris aptera* Hebard, 1932	Baja California

ICHYOTETTIGINI			**Mexico**
Sphenotettix Kevan *et al.*, 1964			**E.C. Mexico**
	**S.nobilis* Kevan *et al.*, 1964		State of Hidalgo
Pyrgotettix Kevan *et al.*, 1964	**P.pueblensiss* Kevan *et al.*, 1964		States of Puebla & (?) Oaxaca
	Pyrgotettix n. sp.? [Kevan*et al., 1971*]	*P. pueblensis* Kevan *et al.*, 1964 *(partim)*	State of Oaxaca
Piscacris Kevan *et al.*, 1964			**S. Mexico**
	P. affinis Kevan *et al.*, 1964		State of Oaxaca
	**P. robertsi* Kevan *et al.*, 1964		State of Guerrero
Ichthyotettix Rehn, 1901		*Ichthydion* Saussure, 1859 *(nec* De Jean, 1833)	**C. & S. Mexico**
	**I. mexicanus* (Saussure, 1859)	*Ichthydion mexicanum* Saussure, 1859	States of Jalisco (E.) Michoacán (E.), Hidalgo México (+ Dist. Fed.), Morelos, Guerrero, Puebla, Vera Cruz (W.), Oaxaca & Chiapas

SPHENARIINI			**Mexico, Central America S.W. China - S.E. Tibet N.E. India, Madagascar, Sokotra L., E. Africa.**
SPHENARIINA			**Mexico, Central America**
Prosphena Bolívar, 1884			**Central America**
	**P. scudderi* Bolívar, 1884		Guatemala, El Salvador, Honduras, Nicaragua & Costa Rica
Sphenarium Charpentier, 1842			**Mexico & Guatemala**
	S. borrei Bolívar, 1884		D.W. Mexico: States of Nayarit, Jalisco, Colima &Michoacán
	S. mexicanum histrio Gerstaecker, 1873	*S.bistrio* Gerstaecker, 1873; *S.carinatum* Bolívar, 1904; *S.magnum* Márquez Mayaudon, 1962 [intermed. to *S. m.mexicanum*]	S. Mexico: States of Michoacán, Guerrero, Oaxaca & Chiapas; S.W. Guatemala
	S.m.mexicanum Saussure, 1859	*S. mexicanum* Saussure, 1859; *Opomala ? crassipes* Walker, 1870; *S. ictericum* Gerstaecker, 1873; *S.bolivari* Bruner, 1906 [intermed. to. *S.m.histrio*]; *S. marginatum* Bruner, 1906	E. Mexico: States of Vera Cruz & Tabasco [intermediates to *S.m. histrio* in N. Oaxaca]
	S.purpurascens minimum Bruner, 1906	*S.minimum* Bruner, 1906; *S.affine* Bruner, 1906	E.C. Mexico: State of Vera Cruz (C.)

	**S.p.purpurascens* Charpentier, 1842	*S.purpurascens* Charpentier, 1842; *S. planum* Bruner, 1906 [intermed. to *S.p. ninim um*]; *S.bruneri* Solivar, 1909	C. & S. Mexico: States of Queretaro, Hidalgo [incl. intermediates to *S.p.minimum*], Mexico (+ Dist. Fed.), Morelos (N.) Puebla[incl. intermediates to *S.p. minimum*], Vera Cruz (W.C.) [intermediates],, Oaxaca & Chiapas
	S.rugosum Bruner, 1906	*S.barretti* Bruner, 1906 (syn.nov.)	W.C. Mexico: States of Jalisco (S.), Colima, Michoacán, México (+ Dist. Fed.), Morelos, Guerrero,, Puebla (S. & W.) & Oaxaca
	S.cariabile, n. sp.	*Sphenarium,* n.sp. a [Kevan *et al.,* 1974]	S. Mexico: State of Oaxaca
	S.macrophallicum, n. sp.	*Sphenarium,* n.sp. *b* [Kevan *et al.,* 1974]	W.C. Mexico: N.W. State of Guerrero
OMURINI			**Tropical South America**
Minorissa Walker, 1870		*Phymaptera* Bolívar, 1884; *Mestraoides* Willemse, 1933	**N.W. South America**

	**M.pustulata* Walker, 1870	*Phymaptera jucunda* Bolívar, 1884; *Mestraoides javana* Willemse, 1933	Venezuela: Distrito Federal (Carácas); Provinces of Miranda, Aragua & ? Amazonas; Colombia: ? N. (needs confirming))
Deraspiella Bolívar, 1905		*Deraspis* Bolívar, 1884 (*nec* Blanchard, 1845)	**Brazil**
	**D.volxemi* (Bolívar, 1884)	*Deraspis* v. Bolívar, 1884	C. & E. Brazil: States of Goiás and Minas Geraes[2]
Omura Walker, 1870		*Protomachus* Stal, 1876	**N. & C. South America**
	**O. congrua* Walker, 1870	"*Gryllus* Acrida *Nasutus*" Houttuyn, 1766 (*nec* Linnaeus, 1758); *Protomachus depressus* Stal; *O.congrua* var. *brunneri* Bruner, 1911	Amazon & Orinoco drainage basins to headwater systems from the Guianas west almost to the Andes; Guyane[3] ; Surinam; Guayana; Venezuela: Provinces of Bolívar, Amazonas & ? Tachira; Colombia (E.):

		Province of Vaupés; Brazil: States of Amapá, Pará, Amazonas (E. to W.) & ? N. Matto Grosso; Ecuador (E.)[4] ; Péru (E.): Provinces of Loreto & Huánuco; Bolivia (N.E.): Province of Beni
Algete Bolívar, 1905		**N.E. Brazil**
	**A.brunneri* Bolívar, 1905	N.E. Brazil: States of Rio Grande do Norte, Paraiba (?) & Pernambuco

1 There are also two specimens allegedly from the States of Sinaloa and Sonora but these are doubtless mislabelled. There are also undoubted specimens from an isolated locality in coastal Vera Cruz (Cerro Gordo) which do not fit well in the distributional picture as it is presently known. 2 *D. volxemi* was previously known (Kevan, 1966) only by 2 females: the holotype (no data closer than "Brasil") and a specimen from Anápolis. Another female has now come to light ("Goiás: Goiatuba [18° 01'S, 49° 18'W.]. Nov. 1961, W. Bokerman), together with a last-instar female nymph from further to the south-east ("*Minas Geraes:* Varghina, 45° 52'W., 22° 20'S., Sept. 1961, Seabra & Alvarenga). Both specimens are in the collection of the Museum of Zoology, University of Michigan, Ann Arbor, Michigan. The nymph is clearly identifiable by the peculiar and characteristic, long, pointed lateral pronotal lobes, but it is of rather different appearance from the adult. 3 A further record from Guyane in addition to the two recorded by Kevan (1966) is given by Descamps and Amedegnato (1970) for Carnope, Oyapock [= R. Oiapoque]. 4 Further records for eastern Ecuador, in addition to those given by Kevan (1966), are for *Napo-Pastaza:* 1 male, 2-8 miles N. of Puyo, 953 m., 9.II.1955; 2 males and 2 females, 6-8 miles W. of Mera, 1500 m., 10.II.1955; all Schlinger & Ross (California Academy of Sciences, San Francisco).

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APPENDIX I

NOTES ON ICHTHIACRIDINI

Since the revision published by Kevan *et al.* (1964), a number of additional specimens of Ichthiacridini, particularly of the genus *Ichthiacris* from Baja California Sur, have come to my attention, and, in view of how poorly known this group is, it is of interest to publish the additional locality records and to comment briefly upon other matters relating to the various species. For the opportunity of examining most of the material, I am grateful to Dr. Eric Fisher, Department of Biology, California State University, Long Beach, California, to whom acknowledgement is also due for assistance in locating some of the more obscure localities that do not appear on standard maps such as that of the National Geographical Magazine, Vol. 103(3), "Mexico and Central America", published in 1953, or that of the Automobile Club of Southern California and the California State Automobile Association, Map No. 2011, "Baja California", issued August, 1970.

Ichthiacris rehni Bolivar, 1905

I. rehni has previously been recorded from Baja California Sur from the following localities (Kevan *et al.* 1964): 20 miles S. of El Arco [which is itself in Baja California Norte], Arroyo Seco [about 25 miles due W of La Paz; there is another in Baja California Norte near Colonet, inland from San Antonio del Mar, but it is not likely to be this one], Coronados I., Danzante I., 12 miles N. of La Paz on road to Pichilingue, Loreto, San Marcos I., Triunfo, 13 miles NW of El Triunfo. In addition, Kevan *et al. (op. cit.)* record six immature specimens from "[Sierra de?] San Lázaro" [presumably = Sierra de la Victoria, the more recent name for these mountains, and not Cabo San Lazaro on the west coast, as the collector, Eisen, does not appear to have visited the latter, although he collected material in the extreme south over at least three seasons, 1893, 1894, and 1898, that in question being 1894]. On a re-examination in the presence of more material including juveniles of *I. rehni* and *I. costulata,* at least one, and possibly all of these, immature specimens have been found to belong to the latter species. Kevan *et al.*, also record the species from [Rancho] Mesquital in Baja California Norte, about 30 miles NW of El Arco.

The following additional material of *I. rehni* from Baja California Sur, received from Dr. Fisher, has also been examined (all collected by E. L. Sleeper and F. J. Moore, unless otherwise indicated): La Paz, 50 ft., 6.X.1968, 3 ♀♀; 59 miles NW of La Paz, 600 ft., 17-18.XI.1968, 1 ♂; NW of La Paz, 600 ft., 24-28.XI.1968 (E. L. Sleeper only), 1 ♂; 3 miles SE. of Pozo Grande, 400 ft., 15-16.XI.1968, 1 ♂, 1 ♀; 19 miles SW of San Miguel Comondu [just W. of San José C.], 800 ft., 14-18.XI.1968, 1 ♂, 2 ♀♀; San Rita [just N. of La Salada], 400 ft., 16-17.XI.1968, 1 ♂, 1 ♀; 2 miles SE. of Santa Rita, 420 ft., 16-17.XI.1968 (collected at "Blacklite"), 1 ♂; Valle Perdido [a few miles S of San Antonio], 1800 ft., 27-29.XI.1968 (E. L. Sleeper), 1 juv. (♀).

Apart from the narrower, more acute fastigium of the vertex and more oblique frontal profile noted by Kevan *et al.* (1964), *I. rehni* differs from *I. costulata* in that the metathoraic epimeron is narrower and less "flared" (*cf.* figures in Kevan *et al.*), and that the integument is more strongly longitudinally ridged. There is, however, a considerable variation in the degree of rugosity. Most commonly the thorax in particular bears numerous small, but quite prominent, almost prickly, tubercles along the ridges. Kevan *et al.* (*op. cit.*, caption to Plate I) suggest that the less strongly tuberculate condition is more normal, but the reverse would now seem to be the case. *I. rehni* also differs from *I.*

costulata in usually having slightly larger particularly wider tegminal vestiges, although these vary (Kevan *et al.* illustrate an extra-narrow form, more common in males). The posterior (dorsal) margin is always quite straight, but the anterior margin is usually very strongly and abruptly curved toward the apex (not as illustrated by Kevan *et al.*, which is a less usual condition, rarely found in females, even when the tegminal vestiges are very short).

Ichthiacris costulata Bolívar, 1905 (=*I. californica* Bolívar, 1905 - *syn. nov.)*

Ichthiacris costulata is recorded by Kevan *et al.* (1964) from the following localities in Baja California Sur: Cabo San Lucas, Corral de Piedra (Sierra de la Taste [about 15 miles W. of Santa Anita]), 12 miles N. of La Paz on road to Pichilingue, Patrocinio [about 32 miles S. of San Ignacio], San José del Cabo. To these should be added San Lazaro on the basis of the immature specimens referred to under *I. rehni.* The alleged type locality of the synonymous *Calamacris oculata* Bruner, 1906, sould presumably have read "extreme southern California", not ". . . Arizona".

Additional material more recently examined (all collected by E. L. Sleeper and F. J. Moore unless otherwise indicated) is a follows: 14 miles S. of El Arco [itself in Baja California Norte; 16-VI.1967 (E. L. Sleeper & E. M. Fisher), 1 ♂; 15 km. E. of Colonv [F. de la] Toba [now Villa Insurgente; 15 ml. NW of Villa Constitucion and almost 30 miles N. of El Refugio], 400 ft., 23-24.XI.1968 (E.L. Sleeper only), 1 ♂; 3 miles E. of La Burrera [a few miles inland from Todos Santos], 1800 ft., 17-19.X.1968, 2 ♀♀; 2.5 miles SE of La Huerta [about halfway between La Paz and Punta de la Ventana], 2200 ft., 8-9.X.1968, 2 juvs. (♂, ♀); 23.0 km. SW La Paz, 120 m. (24110 Cd), Cape thorn forest 2.VI.1973 (E.L. Sleeper only), 1 ♀; 3.5 miles W. of Los Barriles [Buena Vista] 500 ft., 2-3.XI.1968 (E.L. Sleeper only), 2 ♀♀; Santa Rita [just N. of La Salada], 400 ft., 16-17.XI.1968, 1 ♀; 0.5 miles NW of El Triunfo, 1800 ft., 10.X.1968, 2 ♂♂, 1 ♀; 7.5 miles W. of El Triunfo, 1500 ft., 2-3.XI.1968, 1 ♀; Valle Perdido [a few miles from San Antonio], 1800 ft., 27-29.XI.1968 (E.L. Sleeper only), 1 ♀; 2.7 miles SE of Valle Perdido, 1800 ft., 15-16.X.1968, 3 ♂♂, 4 ♀♀.

Many of the specimens listed above have the hind femora reddish in colour (particularly on the inner faces) to varying degrees, namely, those from El Arco, Colonia Toba, La Burrera, Los Barriles (one only), Santa Rita, W. of El Triunfo, and SE of Valle Perdido (males only). This is probably the normal coloration for sexually mature individuals. The Los Barriles and La Burrera females, and more especially one of the latter (which is also rather more robust than normal), have the fastigium of the vertex distinctly broader, and thus proportionately shorter, giving the frontal profile a less strongly oblique aspect, than in the majority of specimens. The last mentioned specimen is very similar in both respects to one previously recorded and figured by Kevan *et al.* (1964) from near Pichilingue, in which, however, the hind femora are not reddened. There is thus now available a series of females intermediate in external morphology between *I. costulata* and *I. californica.* The female paralectotype of the latter seems to differ from *costulata* specimens with a broad fastigium only in that the vertex appears to be rather more convex in lateral view. Males also are variable, but, having generally narrower fastigia of the vertex than females, any differences between them in this character are less clear. I have, however, seen no other male with a fastigium as wide as in the lectotype of *I. californica.* The phallic structures of all males examined, including the lectotype, are quite similar, however, and there seems to be no satisfactory reason for recognizing the two nominal species as distinct from each other, particularly as they are sympatric. It may be noted that the name *I. californica* has page priority over *I. costulata* and that it was described from both sexes (*I. costulata* was based on an unique female type), so that *I. californica* would be the logical selection for a name. In view of the confusion which arose over the specific name of the related *Atyphacris californica* (Bruner), however, it would seem preferable to select *costulata* as the name for such a combined taxon. The selection of the name having page priority is not mandatory according to the International Code of Zoological Nomenclature.

It is interesting to note that, in the original descriptions, very little is given to distinguish *I. costulata* from *I. californica.* In the latter, the tegminal vestiges are said to be very narrow and black-bordered; in the former, they are said to be very small, passing the posterior margin of the mesonotum, their "interior" (posterior) margins straight and their "exterior" (anterior) margins curved; no contrasting character for the two "species" is thus given. In fact the tegminal scales of female *I. costulata* vary considerably, from being extremely minute, parallel-side, apically rounded and not much more than twice as long as wide, to being clearly visible, with the anterior, and sometimes both margins slightly convex and three times as long as wide (*cf.* figure in Kevan *et al.*, 1964); the anterior margin may be black and the rest of the tegmen-scale red, or the whole may be more or less concolorous with the body. The male tegminal vestiges are usually very small and narrow and often more or less sealed with the thorax. The only other supposed differences given in the original descriptions are in the hind legs. The hind femora of the *I. californica* are said to be red internally and the genicular lobe to have a dark mark surrounded paler; *I. costulata* is not noted as having these features, but the hind tibiae are said to be pale; in *I. californica* the hind tibiae are said to have griseous hairs and to be fuscous above the pale in the middle. The *I. costulata* material examined may or may not have any of the characters given for both. It may be noted that the last instar nymphs of this species are very like adults, as external genitalia are quite developed in the males, but the phallic structures are undeveloped, and the tegminal scales and antennae are nymphal in character.

Ichthiacris eloganta Kevan, Singh & Akbar, 1964

I. elongata was previously known only by the type series (Kevan *et al.*, 1964), from the states of Sinaloa (26 miles N. of Pericos) and Sonora (Alamos). Two further specimens are now known from Sinaloa (California Academy of Sciences): 30 miles N of Calican on Mexican Highway 15, 28.VIII.1963 (Grant & Howard), 1 ♀; 5 miles 22.VIII.1964 (Rentz, Rentz & Grant).

Atyphacris californica (Bruner, 1906)

This species has been recorded from specific localities in Baja California Sur only from José del Cabo and "San Lazaro" (for comments on this locality, see under *Ichthiacris rehni*). The latter refers only to immature specimens, but they have been re–examined and seem to be correctly identified. In addition to these records, Kevan *et al.* (1964) report a single female having only the data "San Pedro Martir, L.C., Mex." They suggest that the Sierra San Pedro Martir in Baja California Norte is too far north to be the place in question, but the ruined mission of San Pedro Martir is quite well known and might well have been visited by the anonymous (touring) collector. As we know very little of the northerly distribution of Ichthiacridine, we cannot rule out this, in favour of another San Pedro further south, as being the locality involved. The only further record known to me is a single female labelled "Mex. Baja Calif. Sur, 3 mi E. La Burrera, E., 1800', X–17/19–1968, E.L. Sleeper & F.J. Moore". This locality is a few miles inland from Todos Santos.

Sphenacris crassicornis Bolivar, 1884

The only other unpublished record of an ichthiacridine that is currently at hand is of a male and a female of *Sphenacris crassicornis* from the state of a male and a female of Sphenacris crassicornis from the state of San Luis Potosi, El Salto, 1000 ft., 3.XI.1962 ([H.R.] Roberts).

In the Ichthyotettigini, an additional record of a male of *Ichthyotettix mexicanus* (Saussure, 1859) may be noted: Hidalgo State, 7.5 miles SE of Ixmiquilpán, 6,700 ft., 1.IX.1962 (Ordway & Roberts).

APPENDIX II

PRELIMINARY DIAGNOSES OF TWO NEW SPECIES OF *SPHENARIUM CHARPENTIER*

D. K. McE. KEVAN AND W. K. BOYLE

(Further descriptions to be published later)

Sphenarium variabile n. sp.
(Fig. 7)

As in all species of *Sphenarium,* variable in size, body form, and coloration; generally very similar in appearance to various forms of *S. purpurascens purpurascens* Charpentier, having its very short robust shape, but easily distinguishable in the male sex from all other species of the genus by the comparatively short endophallus with short gonopore processes (aedeagal sclerites) and aedeagal valves (Fig. 1,B,C). *Holotype:* ♂; "Mexico, Oaxaca, 18 mi. NW La Reforma (km. 695 on Hwy. 190; 32 mi. WNW Tequisistlán), 2750', 14 Sept. 1959 (I.J. Cantrall – T.J. Cohn, Nº 116)" [Museum of Zoology, University of Michigan, Ann Arbor, Michigan]. *Allotype:* ♀; same data as holotype. *Measurements:* body length, ♂20, ♀19.5; pronotum, ♂5.0, ♀6.5; hind femur; ♂12.6 x 3.1, ♀13.0 x 2.9; tegmen, ♂4.3, ♀5.2 mm. *Paratypes:* 51 ♂♂, 17 ♀♀, from various localities in the State of Oaxaca: same data as holotype; 2 & 13 mi. SE Talcolula; 45 mi. NW Tequisistlán; Mitla, 5000 ft.

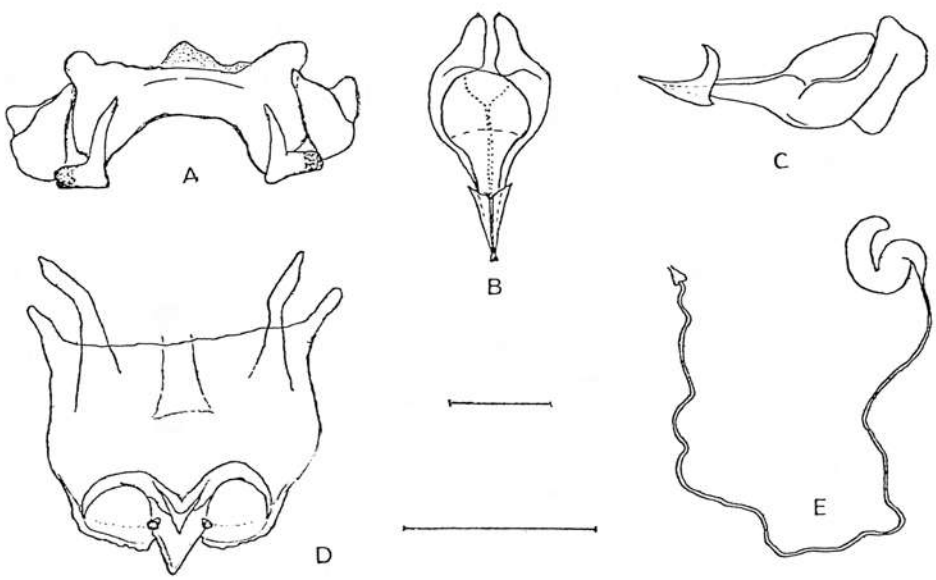

Fig. 7. *Sphenarium variabile,* n. sp., Kevan & Boyle; concealed copulatory structures. A-C,♂; D,E,♀.

Sphenarium macrophallicum n. sp.
(Fig. 8)

Apparently not quite so variable in size, body form and coloration as some species of *Sphenarium;* generally rather similar to *S. mexicanum* Saussure and S. *rugosum* Bruner, having a rather more fusiform appearance than *S. purpurascens* or the above species; easily distinguishable in the male sex from all other species of the genus by the elongate endophallus with extremely long, upwardly curved gonopore processes (aedeagal sclerites) and aedeagal valves (Fig. 2,B,C). These are even longer than in *S. purpurascens* (cf. Kevan, Akbar & Chang, 1974). *Holotype:*♂; "Mexico, Guerrero, 11 road mi. NE of Arcelia, 3000 ft. 8 Dec. 1958 (T.J. Cohn, No. 360)" [Museum of Zoology, University of Michigan, Ann Arbor, Michigan]. *Allotype:*♀ ; "Mexico, Michoacan, Ciudad Altamirano, 20 Oct. 1957 (P. Douglas)" [Museum of Zoology, University of Michigan]. *Measurements:* body length, ♂ 24.6, ♀ 26.5; pronotum, ♂ 5.6, ♀ 8.9; hind femur, ♂ 12.8 x 3.2, ♀ 17.6 x 3.4; tegmen, ♂ 5.4, ♀ 6.3 mm. *Paratypes:* 2♂♂, same data as holotype; 1 ♂, 1 ♀, Guerrero, Temisco, X-XI, 1928, Dr. T.W. Bouchelle; 1 ♂, 1 ♀, same data as allotype.

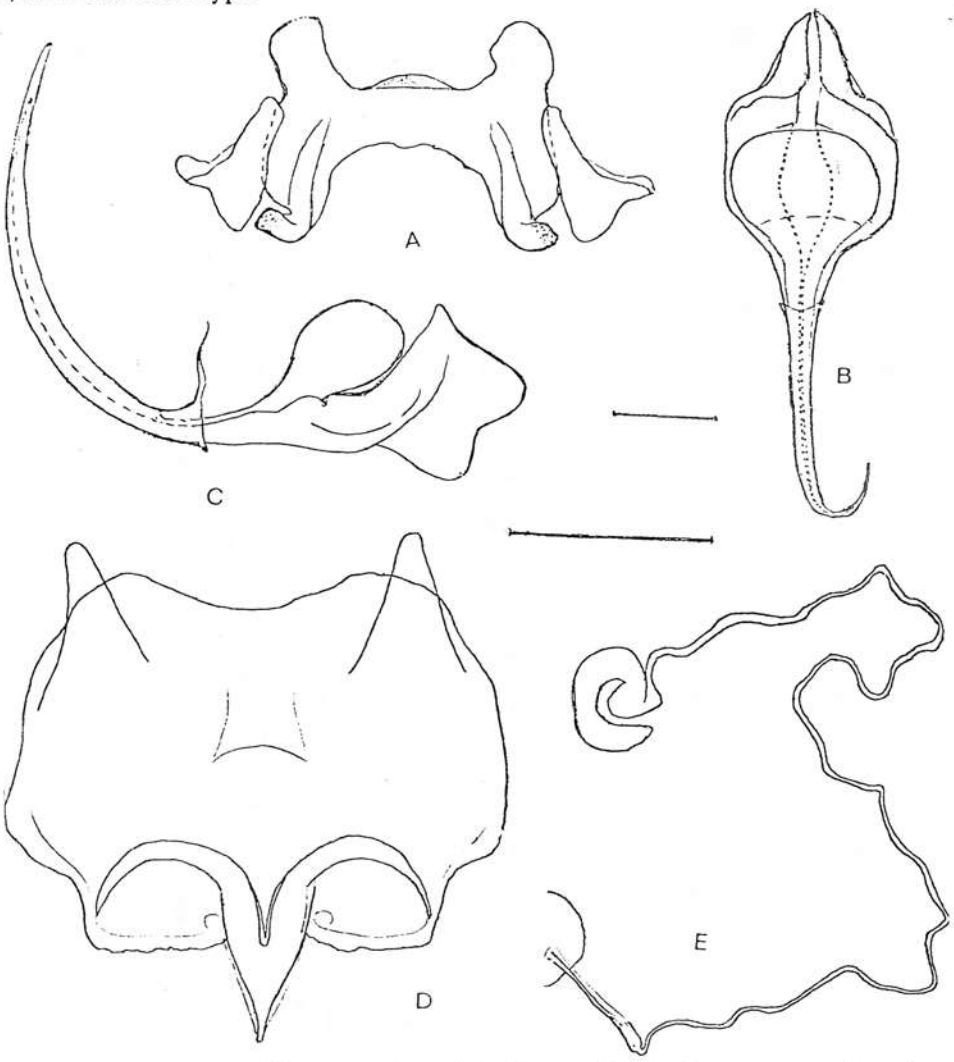

Fig. 8. ***Sphenarium macrophallicum*** **n. sp., Kevan & Boyle; concealed copulatory structures. Lettering and scales as in Fig. 7.**

ADDENDUM

D. K. McE. KEVAN

POSTSCRIPT

Subsequent to the writing of the above, I have read an important contribution by M. Descamps, 1975: "Etude du Peuplement acridien de l'Etat du Veracruz (Mexique)", *Fol. ent. mex. 31-32:* 3-98, which mentions several species from the state mentioned in its title. It gives useful ecological notes on *Sphenarium mexicanum* and *S. purpurascens minimum.*

It should perhape also be noted that there is mention in the same paper of a species called *Halffterina albosignata,* and that this was listed as a new genus and species of Pyrgomorphidae in *Entomological Abstracts, 8* (2): 12 (1977). It was implied that it was a *nomen nudum.* It is, in fact, a member of the acridid subfamily Ommatolampinae, and not a pyrgomorphid. The error is understandable in an abstracting journal because, through some oversight, the family name Acrididae has been omitted from the appropriate parts of the original text.

The actual description of the genus and species (in the appropriate Family) vas given, together with the description of a second Mexican species of the genus *H. furculata* (which was not taken in Veracruz), by M. Descamps, May-June, 1975: "Le groupe des Eucopiocerae (Orth. Acrididae Ommatolampinae)", *Bull. Soc. ent. Fr. 80:* 119-131.

In conclusion, it might also be mentioned that a third adult female specimen of *Deraspiella volwemi* has been discovered in Brazil by M. Descamps, in State of Matto Grosso, Rte. 163, Corrego Boa Vista, 22-I-1972 (Paris Museum). It has very slightly longer tegmina that only other known complete adult, their apices very nearly reach the wind knees.

The actual type locality of *D. volxemi* is uncertain, but it seems that Camille Van Volxem, on his visit to Brazil in 1872, proceeded in the direction of Belo Horizonte, Minas Gerais, and it is most probable that his specimen came from the Atlantic forest zone NNW of Rio de Janeiro, no further north than this locality (Dr. M. A. Monné, Museu Nacional, Rio de Janeiro, personal communication, 1978). Be that as it may, a fairly extensive collection of the species, including males, has very recently been made from three localities in the state of Minas Gerais during November, 1977, by Seabra, Monné and Roppa, as follows: Contagem [W. of Belo Horizonte], 9 ♂♂, 5 ♀♀; Barroso, 4 ♂♂; Tiradentes, 4 ♂♂, 4 ♀♀ (in collection of Dr. C.A.C. Seabra, Rio de Janeiro; 1 ♂, 1 ♀ from Contarem donated to the author and a further pair to Acadamy of Natural Sciences of Philadelphia). A full account of this material, with a description of the male is to be published later by Drs. Seabra and Monné. Males are considerably smaller than females, much more strongly brachypterous, the posterior part of the pronotal disc is not extravagantly produced as it is in the females, and the curious triangular posterior projections of the lateral pronotal lobes are less exaggerated.

Dr. Seabra's collection also provides further Brazilian records of *Omura congrua,* as follows:

Pará: Belém, 15.V.1952, O. Rego col., 2 ♂♂; Mocambo, Belém, 30.XI.1977, J. Becker col. 1 ♂, 1 ♀ juv.; Obidos, XII.1955, F.M. Oliviera col., 2 ♂♂, 3 ♀♀; V.1961, José Brazilino col., 1 ♂, 1 ♀.

Amazonas: Atalaia do Norte, XI. 1977 B. Silva col., 1 ♂; Benjamin Constant, VII. 1977, B. Silva col., 1 ♂, 1 ♀; Manacapurú, X.1977, Descamps, Naville & Becker col., 1 ♂; Tabatinga, X.1977, B. Silva col., 1 ♂, 3 ♀♀.

It may also be noted that the dubious record of this species for the State of Matto Grosso given by Kevan (1966) is incorrect. The Benevides locality in question is in Pará state, S.W. of Belém.